08-16-00

Practitioner's Docket No. PGI 40037 **PATENT**

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: *"All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.' " M.P.E.P. § 601, 7th ed.*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Fang Yi Peng, Zhang Dao Hong, Chen Kang Zhen, Zhou Pei Qiong

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): Soft Polypropylene Melt Spun Nonwoven Fabric

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date August 15, 2000, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL597596539US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Kristine Carroll
(type or print name of person mailing paper)

Kristine Carroll
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

☐ Plant

WARNING: ***Do not*** *use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: ***Do not*** *use this transmittal for the filing of a provisional application.*

NOTE: If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

☐ Divisional.

☐ Continuation.

☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

WARNING: *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).*

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

10 Pages of specification

1 Pages of claims

0 Sheets of drawing

WARNING: ***DO NOT*** *submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).*

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☐ formal

☒ informal

B. Other Papers Enclosed

_____ Pages of declaration and power of attorney

1 Pages of abstract

_____ Other

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. § 1.98)

☐ Form PTO–1449 (PTO/SB/08A and 08B)

☐ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)–(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)–(4).

NOTE: "The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.62, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors." 37 C.F.R. § 1.41(a)(1).

☐ Enclosed

Executed by

(check **all** *applicable boxes)*

☐ inventor(s).

☐ legal representative of inventor(s). 37 C.F.R. §§ 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☒ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized.
(not required unless called into question. 37 C.F.R. § 1.41(d))

6. Inventorship Statement

WARNING: *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of $130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☒ An assignment of the invention to Polymer Group, Inc.

- ☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.
- ☒ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: *A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.*

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED					
Number filed		Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) $690.00
Total Claims (37 C.F.R. § 1.16(c))	6 – 20 =	0	×	$ 18.00	
Independent Claims (37 C.F.R. § 1.16(b))	1 – 3 =	0	×	$ 78.00	
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))			+	$260.00	

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation $690.00

B. ☐ Design application ($310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation $_____

C. ☐ Plant application
($480.00—37 C.F.R. § 1.16(g))

Filing fee calculation $_____

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: *"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).*

WARNING: *"Small entity status must not be established when the person or persons signing the . . . statement can **unequivocally** make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).*

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A, B** or **C** above)

$_____

NOTE: *Any excess of the full fee paid will be refunded if small entitiy status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).*

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee $690.00

☐ Recording assignment
($40.00; 37 C.F.R. § 1.21(h))
(See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".) $ _____

☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached
($130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) $ _____

☐ For processing an application with a specification in
a non-English language
($130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) $ _____

☐ Processing and retention fee
($130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) $ _____

☐ Fee for international-type search report
($40.00; 37 C.F.R. § 1.21(e)) $ _____

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed $_____

14. Method of Payment of Fees

☒ Check in the amount of $690.00

☐ Charge Account No. _____ in the amount of $_____.

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 10.1324 :

☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: *Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.*

☐ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

NOTE: *". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).*

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: *Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).*

NOTE: *37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . " From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.*

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Credit Account No. 10-1324

☐ Refund

SIGNATURE OF PRACTITIONER

Reg. No. 23.076

Russell W. Pyle
(type or print name of attorney)

Tel. No. (312) 236-8123

221 N. LaSalle St., Suite 850
P.O. Address

Customer No. IDON302826

Chicago, IL 60601

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☒ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

SOFT POLYPROPYLENE MELT SPUN NONWOVEN FABRIC

Background

This invention relates to nonwoven fabrics and more particularly to fabrics made from thermoplastic polymers such as polypropylene.

In general, melt spinning involves the extrusion of molten polymer through a number of small orifices in a spinneret to form fibers or filaments. In the well-known spunbonding process, these filaments are drawn and then collected on a moving foraminous surface, such as a wire mesh conveyor belt. The web is then consolidated by some means, usually involving heat and pressure, such as thermal point bonding. A cohesive fabric of continuous filament fibers is thus provided.

A related process is the melt blown process, which also relies upon the extrusion of molten polymer through a number of orifices in a die. Here, the drawing process involves hot, high velocity air, which significantly reduces the filament diameter and breaks the continuous filaments into so-called microfibers of varying length to diameter ratio.

Currently, many nonwoven manufacturing lines include at least two spunbond stations and optionally one or more meltblown stations in between. This enables the continuous production of a composite fabric consisting of discrete spunbond and meltblown layers. These fabrics are commonly called SMS, referring to a spunbond-meltblown-spunbond arrangement of layers. Such webs are typically consolidated by thermal point bonding.

Polypropylene is used as the base resin for many commercial spunbond, meltblown and SMS fabrics. Such fabrics have a wide variety of end uses, including liners for sanitary articles, such as disposable diapers and feminine hygiene products and in protective apparel. In these applications, softness is a highly desirable attribute, due to intimate contact of the article with the skin of the user.

Improvements in tactile softness, also referred to as hand, have been approached in a number of ways. The use of polyethylene as the base resin produces a silky hand. However, these fabrics have greatly reduced abrasion resistance and tensile strength and are not suited to many of the standard applications. Further, polyethylene is more difficult to process than polypropylene and significant costs are incurred due to process inefficiencies. These issues are partially addressed by the bicomponent filaments, which provide two polymers in a single filament, where the polymers are strategically placed in the filament cross-section. Polypropylene-polyethylene or polyester-polyethylene bicomponent fibers are examples of this technology. Side-by-side and sheath-core filament geometries are familiar to those skilled in the art. However, special spinnerets and additional extruders are required for such spinning operations. Other operating inefficiencies also exist and the full softness benefits of the polyethylene component are not realized in fabrics produced from these filaments. Topical treatments which increase the slickness of the surface are known to provide a perception of tactile softness. Silicone and oleate treatments have been reported in the art. However, the oily feel of such

treated fabrics is not appreciated by the market place. The use of melt additives is also known in the art. Glycerol monostearate, and fatty acid esters are repeatedly cited in the art for having combined surface effects of hydrophilicity and tactile softness such as described in U.S. patent no. 5,244,724. However, the practical demonstration of actual improvements in tactile softness is not evident. Further, softness comfort for the wearer of a garment, such as a diaper, is a combination of attributes - requiring both tactile and ductile (bending ease) softness. With the exception of nonwoven fabrics produced from a polyethylene base resin, ductile softness improvements are not provided by the designs of the considered prior art. A mechanical approach to providing both tactile and ductile softness relies upon the production of very fine diameter filaments in the spunbond fabric. Here, the fiber diameters begin to approach the upper boundaries of the defined diameters for meltblown microfibers. This technology is discussed in U.S. patent nos. 5,810,954 and 5,733,635. Such fabrics have recognizable benefits in softness, but the production inefficiencies are such that the fabrics are frequently not cost competitive in the market place.

In general, it is known to incorporate certain fatty acid amides into polypropylene melts to provide a durable surface lubricant to the resulting fibers or filaments as disclosed in U.S. patent no. 3,454,519. It has further been noted that such additives can render polyolefin fabrics more wettable, as described in U.S. patent no. 5,033,172, by way of example. Such amides are also known as anti-blocking agents in the production of thermoplastic films and the prior art contains many citations of that application.

Summary of the Invention

It has been discovered that very distinct tactile and ductile softness can be obtained in melt spun fabrics by the melt addition of a particular combination of fatty acid amides. The blend of fatty acid amides is provided comprising 25 to 40 percent erucamide and 60 to 75 percent stearamide. These amides are compounded into a polypropylene base resin and produced as concentrate pellets containing 1 to 15 percent total amide loading. The concentrate pellets are introduced into the extruder feed with the base polypropylene resin at a 2 to 10 percent letdown, with 3 to 6 percent preferred.

Upon extrusion into filaments or fibers, the resulting web is thermally point bonded to produce a fabric which is then wound into rolls. There is an appreciable improvement in softness without a negative impact on the physical properties of the fabric, such as tensile strength, or on the process efficiencies as compared to the same process without the use of the additive.

Detailed Description

Processes for making nonwoven fabrics by melt extrusion of thermoplastic polymers are well known and suitable equipment is commercially available. In a spunbonding process, molten polymer is extruded under pressure through a large number of orifices in a plate known as a spinneret or die. The resulting filaments are quenched and drawn by any of a number of methods, such as slot draw systems, attenuator guns or Godet rolls. The filaments are collected as a

loose web on a moving foraminous surface, such as a wire mesh conveyor belt. When more than one extruder is in line for the purpose of forming a multilayered fabric, the subsequent webs are collected upon the topmost surface of the previously formed web. The web is then consolidated by some means involving heat and pressure, preferably thermal point bonding for the present invention. Using this means, the web or layers of webs are passed between two hot metal rolls, one of which has an embossed pattern to achieve the desired degree of bonding, usually on the order of 15 to 35 percent. If a layer or layers of meltblown microfibers are incorporated into the composite fabric to produce a SMS fabric, a standard meltblown process is also employed. Here the molten polymer is again extruded under pressure through orifices in a spinneret or die. High velocity air impinges upon the filaments as they exit the die. The polymer stream is thus rapidly quenched and attenuated. The energy of this step is such that the formed filaments are greatly reduced in diameter and are fractured so that fibers of finite length are produced. This differs from the spunbond process where the continuity of the filaments is preserved. The process to form either a single layer or a multilayer fabric is continuous, that is, the process steps are uninterrupted from extrusion of the filaments to form the first layer until the bonded web is wound into a roll. Methods for producing these types of fabrics are described in U. S. patent no. 4,043,203, incorporated herein by reference.

In accordance with the present invention, a particular blend of fatty acid amides is added to the raw polypropylene polymer prior to extrusion. A blend of stearamide and erucamide is prepared as a concentrate in a suitable polyolefin

resin, such as Exxon 3445 polypropylene, at a level of one to 15 percent of the fatty acid amide blend by weight. The concentrate and resin are then produced as a pellet to facilitate mixing with the base polyolefin feedstock at the extruder.

The blend comprises from about 25 to 40 percent erucamide and from about 60 to 75 percent stearamide based on the total weight of the two additives, with about a 1:2 ratio preferred. The concentrate pellets are then added directly into the extruder with the neat polypropylene feedstock at a letdown of two to ten percent based on the total weight of the concentrate and the base resin combined, preferably four to six percent. The filaments or fibers thus produced contain at least about 0.02 percent the amide blend, with 0.2 - 1.0 percent preferred. The combination of the fatty acid amide additives and the polypropylene resin were processed without measurable detrimental effects on the manufacturing efficiencies or uniform production of the fabric. The resultant webs are thermally bonded to produce the final fabric.

In addition, the ductile softness, described herein as bending resistance, of the consolidated fabric will be less than about 0.62 gram per gram of fabric as determined by the Handle-O-Meter test described in the examples. This value represents about a ten percent improvement in ductile softness of the fabrics of the invention as compared to similarly prepared fabrics without the addition of the amide blend as described. This value is appreciated in the market as a factor of comfort , such that wrinkles and designed folds of the fabric in the garments will not be stiff and therefore coarse and abrasive to the skin. When combined with the tactile softness improvements discussed in the examples, the

fabrics of the invention provide a recognizable improvement over fabrics currently available for the expected end use applications, such as absorbent articles and protective apparel.

Examples

Comparative samples were produced using a standard manufacturing line and Exxon 3445 polypropylene or Dow polyethylene, without the additive. Comparative example 1 was a two-layered spunbond polyethylene fabric at 27 grams per square meter (gsm) basis weight. Comparative example 2 was a 15 gsm two layered spunbond polypropylene. Comparative example 3 was a 15 gsm polypropylene SMS fabric. Example fabrics of the invention were produced on the same equipment as comparative examples 2 and 3. These fabrics were produced with a four to six percent letdown of the concentrate pellets containing the additives. Example 1 was a 15 gsm two layered spunbond polypropylene. Example 2 was a 15 gsm polypropylene SMS.

Tensile strength tests were conducted on spunbond and SMS fabrics produced according to this invention. These results were compared to results for fabrics similarly produced without the additive package. These tests revealed that there is no significant impact on the strength properties of the fabrics of this invention.

Tactile softness of the fabrics were evaluated by ten panelists in a blind test who ranked fabrics in the test set on a comparative scale of 1 to 8, where 1 was the softest fabric and 8 was the harshest hand by comparison. Comparative

examples and example fabrics of the invention were evaluated in the same test set. Tactile softness was rated by rubbing the fabric between the fingertips (Softness) and by stroking the fabric surface with the fingertips (Smoothness). The results of these evaluations are presented in Table I. Note that, as expected, the polyethylene spunbond sample was rated the softest, with the example of the invention receiving a rating of 2, although the polyethylene sample did not rate well on smoothness.

Ductile softness (flexural resistance or bending resistance) was evaluated using a Handle-O-Meter tester available from Thwing-Albert. Fabrics were cut into 4" x 4" test samples, with the MD and CD directions noted. The slot width on the test surface was set at 0.375". Samples were placed on the test surface so that the slot was centered from the edges and the noted test direction, MD or CD, was perpendicular to the slot. The penetration beam was activated and the digital reading of the bending resistance was recorded in grams, where higher values indicate increased bending resistance and less ductile softness. Each sample was then rotated 90° for another reading. Then the sample was turned over and two additional readings at 90° rotations were taken. In this manner, each test sample produced four readings. Each fabric sample was tested in duplicate. The data presented in Table II. includes the average of the readings for each example fabric tested as well as a value normalized for fabric basis weight. Fabrics of the invention were noted to have substantially lower values than the comparative samples. Example 1 has a value approximately 50% less than the comparable all polypropylene comparative . For the SMS fabrics, the

difference was an approximately 15% improvement in ductile softness for the fabrics of the invention.

TABLE I. Tactile Softness Evaluation

Examples		**Evaluation**	
	type	**Softness**	**Smoothness**
Comp. Ex 1	SS	1	8
Comp. Ex 2	SS	5	7
Comp. Ex. 3	SMS	8	7
Example 1	SS	2	5
Example 2	SMS	6	3

Rating scale = 1 - 8, where 1 is softest

TABLE II,. Bending Resistance

Examples	Average, g	Bending Resistance per unit Basis Weight, g/ gsm
Comp. Ex. 1	7.09	0.26
Comp. Ex. 2	10.12	0.67
Comp Ex. 3	10.6	0.71
Example 1	5.08	0.33
Example 2	9.08	0.61

CLAIMS

1. A soft, melt extruded polypropylene fabric, said fabric comprising thermally bonded polypropylene filaments containing, as a melt additive, a blend of fatty acid amides in said polypropylene in an amount of at least 0.02%, said blend comprising stearamide and erucamide, where the amount of stearamide is greater than the amount of erucamide, where the bending resistance of the fabric is less that about 0.62 grams per gram of fabric.

2. The fabric of claim 1 where the blend comprises 25 to 40 percent erucamide.

3. The fabric of claim 1 where the blend comprises 60 to 75 percent stearamide.

4. The fabric of claim 1 used as a component in an absorbent article.

5. The fabric of claim 1 used as a component in a protective apparel article.

6. The fabric of claim 1 where the blend comprises from about 0.2 to about 1.0 percent of the weight of the fabric.

ABSTRACT

A blend of fatty acid amides is incorporated into the polypropylene fibers of a thermally bonded, melt extruded nonwoven fabric to import softness to the fabric. The blend includes a greater amount of stearamide and a lesser amount of erucamide.